

PROMOTION OF PROCESS SAFETY COMPETENCY FOR OPERATORS FOR

October, 2017

SAMI ALMAIYAD

OUTLINES

- Operator error
- Competence in historical incidents
- ICHemE Process Safety Competency Model
- JQP system in Ibn Sina
- Developing process safety competency
- Conclusion

OPERATOR ERROR

OPERATOR ERROR was the primary cause of 22% of the large property damage losses in the hydrocarbon-chemical industries.

This statistic does not provide a solution to the problem – how can we reduce this particular cause of accidents or losses?

Operators are the **LASE LINE OF DEFENSE** in preventing an accident: If all other measures fail, it's the operator who can prevent the accident.

Thus, the operator is impacting plant safety twice:

As a potential cause of the error **AND**

as a means to prevent an accident.

* Reviewing thirty years of accidents, Marsh and McLellan (1998, p.2)

OPERATOR ERROR

What can be done to ensure that all operators always operate the plant safely

AND

To maximize the operator's readiness to be able to identify critical conditions in the plant and to take the right actions to prevent an accident.

PROCESS SAFETY COMPETENCE...

LACK OF COMPETENCE PLAYS A ROLE IN HISTORICAL LARGE INCIDENTS

Oppau 1921, BASF: Ammonium Nitrate explosion

> 1000 t Ammonium Nitrate exploded

**LACK OF UNDERSTANDING PRODUCT
PROPERTIES, CONSEQUENCES OF
PROCESS CHANGES**

Large offsite impact, 1 km Radius of destruction
560 Fatalities

Bhopal 1984, UC: Methyl-Isocyanat release

30 tons of MIC released (highly toxic gas)

Operator Mistake

Leadership failure

Large offsite impact, 3 km Radius
2500 Fatalities, 300 000 injured

PROCESS SAFETY COMPETENCE... EXAMPLES OF INCIDENTS, LAST DECADE

Toulouse 2001, AZF: Ammonium Nitrate explosion

300 t Ammonium Nitrate exploded

LACK OF UNDERSTANDING PRODUCT PROPERTIES

offsite impact; 0,5 km Radius of destruction

30 Fatalities

Similarities to 1921 BASF accident;

US, Texas City 2005, BP: Refinery explosion

Explosion after liquid release from flare

Startup, MANAGEMENT OF CHANGE, SAFETY MANAGEMENT
SYSTEM

16 Fatalities; 2 Billion \$ damage

COMMON FINDINGS

AS PRODUCED BY ACTUAL INCIDENT INVESTIGATION SYSTEM

Root causes for human error :

Lack of Competency

Procedure not followed

Procedure incomplete

PROCESS SAFETY COMPETENCY FOR OPERATORS

WHAT IS PROCESS SAFETY COMPETENCY (PSC) ?

“IT IS NOT, OF COURSE,
SUFFICIENT TO HAVE
KNOWLEDGE.

IT IS NECESSARY
TO BE ABLE TO APPLY IT
TO REAL-LIFE PROBLEMS.”

BY TREVOR KLETZ

2015 ICHME PROCESS SAFETY COMPETENCY MODEL

ICHEME COMPETENCY MATRIX

| | | | |
|---------------------------------------|---|----|--|
| 1. Awareness | Has knowledge of theory and displays conceptual understanding. Actively participates in discussions regarding the skill. Performs routine tasks with significant supervision. Learns how to do things. | T | Technical elements |
| 2. Basic application | Performs fundamental and routine tasks. Requires occasional supervision. Increases functional expertise and ability. Works with others. | M | Management elements |
| 3. Skilled application/ Proficient | Independent contributor. Integrates work with other disciplines. Frequently mentors or coaches others. Assesses and compares alternatives and opportunities. Builds networks with others skilled in application or mastery. | TA | Technical authority role responsibilities |
| 4. Mastery/expert | Advanced experience in the particular skill. Applies creative solutions to complex problems. Defines and drives critical business opportunities and needs. Represents the organisation internally and externally on critical issues. Sets standards within the organisation. Recognised as subject matter expert. | | |
| NA | Not applicable or no role requirement. | | |

Awareness (Technical Element)

1. Project management
2. Safety in design including systems
3. Asset integrity – inspection and maintenance
4. Management of change
5. Safety systems analysis
6. Systems, manuals and drawings
7. Management of operational interfaces
8. Contractor & supplier selection and management
9. Defect identification, elimination and RCA
10. Legislation and regulations
11. Codes and Standards
- 12 Audit, assurance, management review and intervention

ICHEME COMPETENCY MATRIX

OPERATOR COMPETENCY

Basic Application (Management Element)

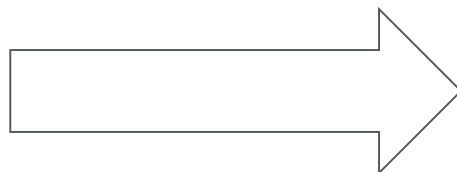
1. Process safety concepts
2. Hazard identification and risk assessment
3. Hazard awareness and characterization associated with the system being operated and product processed
4. Management of major emergencies and emergency preparedness
5. Process & operational status monitoring & handover
6. Management of safety critical elements
7. Incident reporting and investigation
8. Human factors
9. Safety leadership commitment, responsibility and workplace culture

PROCESS SAFETY COMPETENCY FOR OPERATORS IN IBN SINA

JQP SYSTEM IN IBN SINA

7 levels

Filed operator to Panel



Content

- General EHS
- Operating procedures
- Control narratives
- Interlock
- Unit chemistry

Process Safety Management

Process Safety Management is established by managing the plant integrity,

and requires a proper response in case it fails.

managing Integrity involves plant design, maintenance and operation,

which is continuous improved by learning from incidents.



PSC Contents

Process Safety

- What is Process Safety ?
- Learning from Incidents
- LOPC
- Layers of protections
- PS KPI's
- Understanding product properties

Design Integrity

- Hazard Identification
- Risk Assessment
- Risk mitigation

Operational Integrity

- Procedures
- Operating Procedures (safe operating limits and consequence of deviation)
- Maintenance Procedures
- Pre-Startup Reviews
- Management of Change

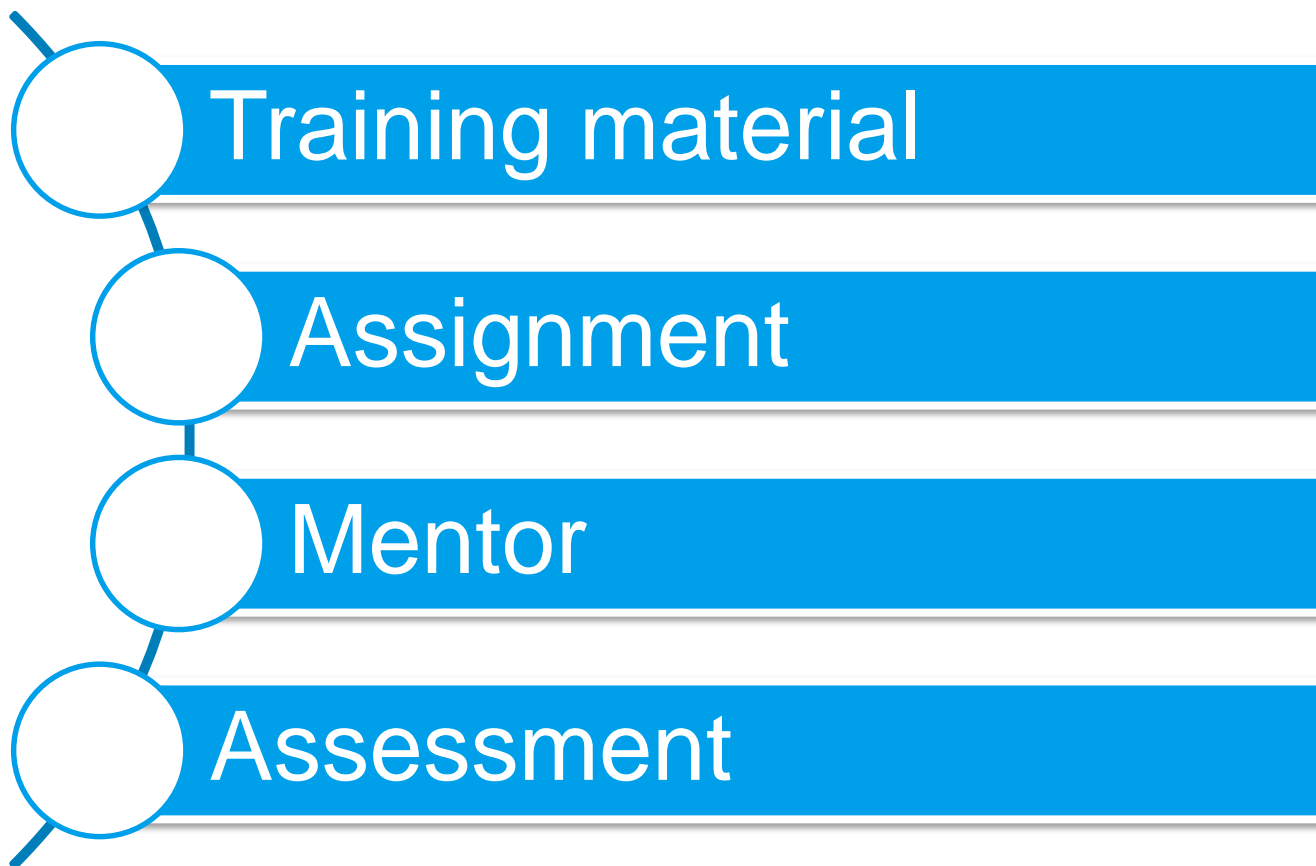
Mechanical Integrity

- Rotating Equipment
- Pressure Relief
- Instruments and Alarms
- Tanks, Vessels & Piping
- Blinds
- Car seals
- Hoses
- Bypassing EHSS Criticals
- Cathodic Protection

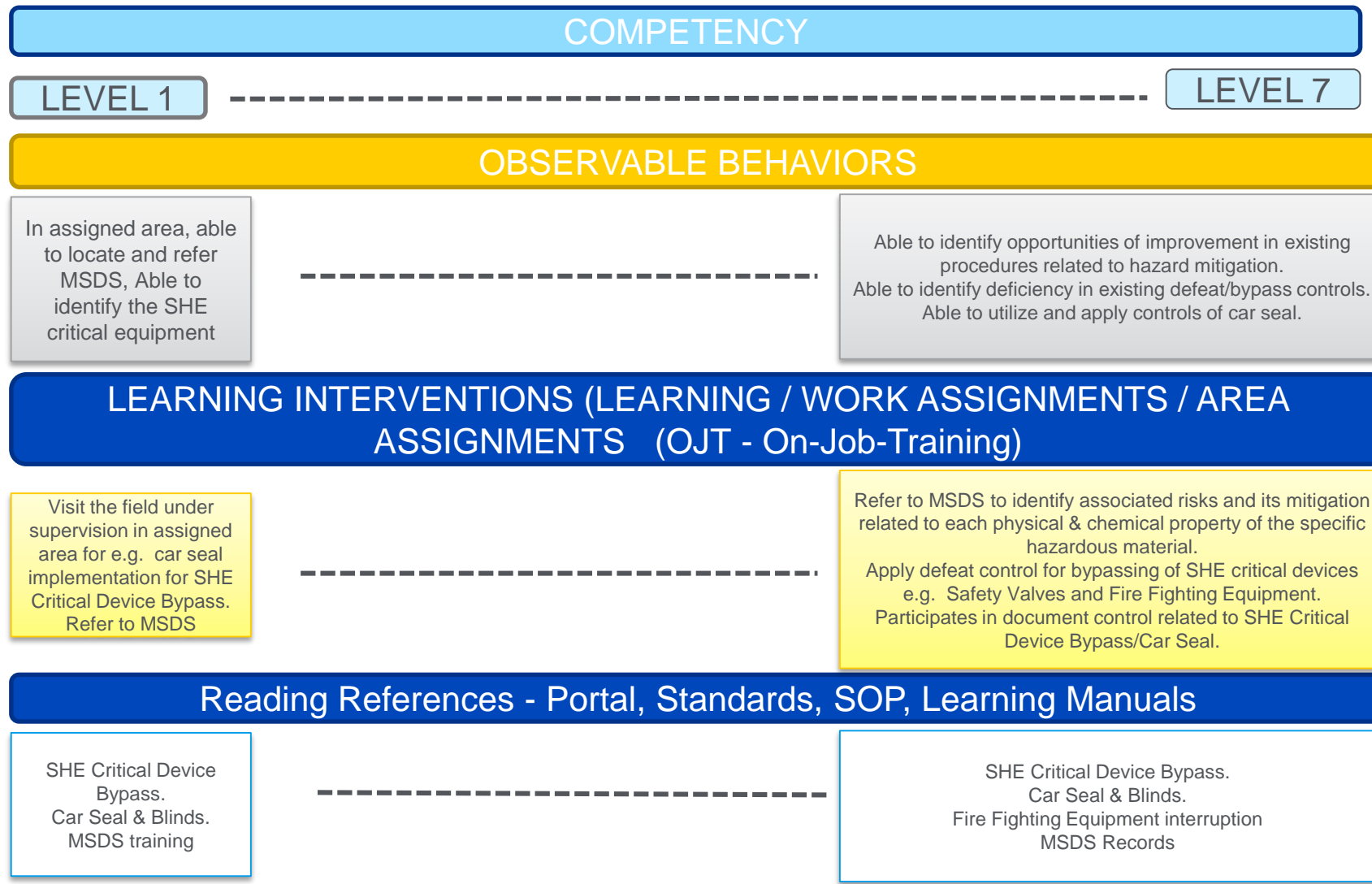
Emergency Response

- Crisis Management
- Response Team

PROCESS SAFETY COMPETENCY (PSC)



PROCESS SAFETY COMPETENCY MATRIX



CONCLUSION

“Operator Error” was the primary cause of 22% of the large property damage losses in the hydrocarbon-chemical industries.

The operator is impacting plant safety twice: as a potential cause of the error AND as a means to prevent an accident.

Process Safety Management is established by managing the plant integrity, and requires a proper response in case it fails.

Managing integrity involves plant design, maintenance and operation, which is continuous improved by learning from incidents.

Q&A

Thank You